



Environment Testing  
America

## ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-36892-2  
Client Project/Site: HPNS- Parcel E 500712  
Revision: 1

For:  
Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Eddie Kalombo

*Rhonda Ridenhower*

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Authorized for release by:  
4/28/2021 9:18:48 AM

Rhonda Ridenhower, Client Service Manager  
(314)298-8566  
Rhonda.Ridenhower@Eurofinset.com

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*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

**Job ID: 160-36892-2**

**Laboratory: Eurofins TestAmerica, St. Louis**

Narrative

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: HPNS- Parcel E 500712**

**Report Number: 160-36892-2**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup  
Method 3620C: Florisil Cleanup  
Method 3630C: Silica Gel Cleanup  
Method 3640A: Gel-Permeation Cleanup

# Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Job ID: 160-36892-2 (Continued)

### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Method 3650B: Acid-Base Partition Cleanup

Method 3660B: Sulfur Cleanup

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Reported DLC for 21 day count gamma

#### RECEIPT

The samples were received on 01/06/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 20.0 C which is acceptable for all analysis in job series 2.

#### TOTAL BETA STRONTIUM (GFPC)

Samples PE-BS-VULCAN-S001 (160-36892-1), PE-BS-HANSON-S001 (160-36892-2) and PE-BS-DUTRA-S001 (160-36892-3) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 01/07/2020, prepared on 01/10/2020 and analyzed on 01/28/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE-BS-VULCAN-S001 (160-36892-1), PE-BS-HANSON-S001 (160-36892-2) and PE-BS-DUTRA-S001 (160-36892-3) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 01/07/2020, prepared on 01/09/2020 and analyzed on 01/30/2020 and 02/03/2020.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

PE-BS-VULCAN-S001 (160-36892-1), PE-BS-HANSON-S001 (160-36892-2), PE-BS-DUTRA-S001 (160-36892-3), (MB 160-456354/1-A) and (160-36892-A-2-D DU)

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

#### Inferred from      Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Insufficient sample was provided for the following sample to fill a geometry (e.g. tuna can) calibrated for Ra-226 analysis by gamma

## Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

### Job ID: 160-36892-2 (Continued)

#### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

spectroscopy: PE-BS-VULCAN-S001 (160-36892-1). The use of a different geometry could potentially bias the results low due to the loss of radon into the headspace of the container.

The following samples, analyzed by gamma spectroscopy, have lead-210 as a requested analyte. Lead-210, energy 46.54 keV, is out of calibration range for water and Density-equals-one geometries. The results are estimated. The data have been reported with this narrative. PE-BS-VULCAN-S001 (160-36892-1).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



PTM Federal Services, Inc.

Part II: Federal Services

## CHAIN OF CUSTODY

Ref. Document # PG 115 All 001

4005 Port Chicago Hwy  
Concord, CA 94520

Project Manager Tim Kenner

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Send Report To: Eddie Kalombo  
Phone/Fax Number: 415.987.0760  
Address: 4005 Port Chicago Hwy.  
City: Concord, CA 94520  
Email: eddiekalombo@optin.com

Simpler Name(s); Eddie Kalombo



80-36882 Chain of Custody

Temp

7 days ingrown draft and follow with 21 days final.

Standard TAT-10-day		<input type="checkbox"/> 24-hr		<input type="checkbox"/> 48-hr		Level of QC Required		Method Codes	
Established By:	Replaced By:	<input type="checkbox"/> 72 hr	<input type="checkbox"/> 5 day	<input type="checkbox"/> II	<input type="checkbox"/> III	<input type="checkbox"/> IV	Project Specific	<input type="checkbox"/> G	<input type="checkbox"/> C-G
EPA	WRI, EPA, WRI	<i>John Doe</i>	<i>John Doe</i>	<i>John Doe</i>	<i>John Doe</i>	<i>John Doe</i>	Project Specific	<input checked="" type="checkbox"/> G	<input type="checkbox"/> C-G
Established By:	Replaced By:	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00	Date: 12/30/00
		Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM	Time: 10:00 AM
Method Codes		I		II		III		IV	
I = Low Flow		II = Drinking Water		III = Ground Water		IV = Waste Water		V = Soil	
BW = Blank Water		GW = Ground Water		WW = Waste Water		WP = Waste product			

Ref. Document # PG 115 All 001

## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-36892-2

**Login Number:** 36892

**List Source:** Eurofins TestAmerica, St. Louis

**List Number:** 1

**Creator:** McKinney, Gerrod E

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	Refer to Job Narrative for details.
Cooler Temperature is acceptable.	False	Refer to Job Narrative for details.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Qualifiers

Rad Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
%	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

## Method Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

### Protocol References:

DOE = U.S. Department of Energy

None = None

### Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Eurofins TestAmerica, St. Louis

## Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-36892-1	PE-BS-VULCAN-S001	Solid	12/27/19 08:13	01/06/20 09:15	
160-36892-2	PE-BS-HANSON-S001	Solid	12/27/19 09:44	01/06/20 09:15	
160-36892-3	PE-BS-DUTRA-S001	Solid	12/16/19 13:00	01/06/20 09:15	

Eurofins TestAmerica, St. Louis

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

**Client Sample ID: PE-BS-VULCAN-S001**

**Lab Sample ID: 160-36892-1**

Matrix: Solid

Date Collected: 12/27/19 08:13

Date Received: 01/06/20 09:15

**Method: 905.0 - Total Beta Strontium (GFPC)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	-0.00264	U	0.0667	0.0667	0.160	0.0550	pCi/g	01/10/20 08:39	01/28/20 09:14	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	87.2		40 - 110					01/10/20 08:39	01/28/20 09:14	1

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	0.367	U	0.824	0.825		0.700	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Actinium-228</b>	<b>1.73</b>		0.537	0.563		0.156	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Americium-241	-0.112	U	0.127	0.128		0.120	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Bismuth-212	0.408	U	1.47	1.47		1.17	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Bismuth-214</b>	<b>0.944</b>		0.310	0.324		0.144	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Cesium-137	-0.0728	U	0.145	0.145	0.0700	0.123	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Cobalt-60	-0.141	U	0.215	0.215	0.200	0.134	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Lead-210	0.264	U	1.12	1.12		0.788	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Lead-212</b>	<b>1.29</b>		0.211	0.253		0.104	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Lead-214</b>	<b>0.906</b>		0.225	0.242		0.132	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Potassium-40	31.2		3.81	4.86		0.630	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Protactinium-231	1.13	U	3.29	3.29		3.42	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Radium-226</b>	<b>0.944</b>		0.310	0.324	0.200	0.144	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Radium-228</b>	<b>1.73</b>		0.537	0.563		0.156	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Thallium-208	0.409		0.157	0.162		0.0703	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Thorium 228</b>	<b>1.29</b>		0.211	0.253		0.104	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Thorium-232</b>	<b>1.73</b>		0.537	0.563		0.156	pCi/g	01/09/20 13:13	02/03/20 07:23	1
<b>Thorium-234</b>	<b>0.938</b>		0.825	0.831		0.740	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Uranium-235	-0.328	U	0.378	0.379		0.605	pCi/g	01/09/20 13:13	02/03/20 07:23	1
Uranium-238	0.938		0.825	0.831		0.740	pCi/g	01/09/20 13:13	02/03/20 07:23	1

**Client Sample ID: PE-BS-HANSON-S001**

**Lab Sample ID: 160-36892-2**

Matrix: Solid

Date Collected: 12/27/19 09:44

Date Received: 01/06/20 09:15

**Method: 905.0 - Total Beta Strontium (GFPC)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	-0.0534	U	0.0682	0.0683	0.160	0.0603	pCi/g	01/10/20 08:39	01/28/20 09:14	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	83.2		40 - 110					01/10/20 08:39	01/28/20 09:14	1

**Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)**

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	0.217	U	0.522	0.523		0.432	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Actinium-228</b>	<b>0.657</b>		0.359	0.365		0.169	pCi/g	01/09/20 13:13	01/30/20 08:46	1

Eurofins TestAmerica, St. Louis

# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

**Client Sample ID: PE-BS-HANSON-S001**  
Date Collected: 12/27/19 09:44  
Date Received: 01/06/20 09:15

**Lab Sample ID: 160-36892-2**  
Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Americium-241	0.0493	U	0.197	0.197		0.160	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Bismuth-212	-0.537	U	1.20	1.20		0.956	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Bismuth-214</b>	<b>0.561</b>		0.162	0.172		0.0698	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Cesium-137	-0.000826	U	0.0628	0.0628	0.0700	0.0562	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Cobalt-60</b>	<b>0.0552</b>		0.0361	0.0365	0.200	0.0131	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Lead-210	2.03		1.69	1.71		1.11	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Lead-212</b>	<b>0.653</b>		0.127	0.152		0.0658	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Lead-214	0.607		0.162	0.174		0.0954	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Potassium-40	11.5		1.69	2.06		0.403	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Protactinium-231	-0.516	U	3.28	3.28		2.68	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Radium-226</b>	<b>0.561</b>		0.162	0.172	0.200	0.0698	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Radium-228	0.657		0.359	0.365		0.169	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Thallium-208	0.303		0.0770	0.0832		0.0250	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Thorium 228</b>	<b>0.653</b>		0.127	0.152		0.0658	pCi/g	01/09/20 13:13	01/30/20 08:46	1
<b>Thorium-232</b>	<b>0.657</b>		0.359	0.365		0.169	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Thorium-234	-1.29	U	0.809	0.822		1.58	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Uranium-235	-0.255	U	0.734	0.734		0.599	pCi/g	01/09/20 13:13	01/30/20 08:46	1
Uranium-238	-1.29	U	0.809	0.822		1.58	pCi/g	01/09/20 13:13	01/30/20 08:46	1

**Client Sample ID: PE-BS-DUTRA-S001**

**Lab Sample ID: 160-36892-3**

Date Collected: 12/16/19 13:00  
Date Received: 01/06/20 09:15

Matrix: Solid

## Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	-0.0502	U	0.0641	0.0642	0.160	0.0567	pCi/g	01/10/20 08:39	01/28/20 09:14	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	87.1		40 - 110					01/10/20 08:39	01/28/20 09:14	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	0.261	U	0.357	0.359		0.344	pCi/g	01/09/20 13:13	01/30/20 11:21	1
<b>Actinium-228</b>	<b>0.838</b>		0.220	0.236		0.0344	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Americium-241	-0.0434	U	0.165	0.165		0.113	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Bismuth-212	0.325	U	0.834	0.835		0.656	pCi/g	01/09/20 13:13	01/30/20 11:21	1
<b>Bismuth-214</b>	<b>0.573</b>		0.185	0.195		0.0729	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Cesium-137	0.0181	U	0.0458	0.0458	0.0700	0.0351	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Cobalt-60	0.0282	U	0.0508	0.0508	0.200	0.0450	pCi/g	01/09/20 13:13	01/30/20 11:21	1
<b>Lead-210</b>	<b>0.973</b>		1.32	1.33		0.880	pCi/g	01/09/20 13:13	01/30/20 11:21	1
<b>Lead-212</b>	<b>0.620</b>		0.136	0.158		0.0824	pCi/g	01/09/20 13:13	01/30/20 11:21	1
<b>Lead-214</b>	<b>0.668</b>		0.142	0.158		0.0665	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Potassium-40	17.4		2.06	2.72		0.267	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Protactinium-231	0.000	U	0.892	0.892		2.39	pCi/g	01/09/20 13:13	01/30/20 11:21	1

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# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

**Client Sample ID: PE-BS-DUTRA-S001**

**Lab Sample ID: 160-36892-3**

Date Collected: 12/16/19 13:00

Matrix: Solid

Date Received: 01/06/20 09:15

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Radium-226	0.573		0.185	0.195	0.200	0.0729	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Radium-228	0.838		0.220	0.236		0.0344	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Thallium-208	0.286		0.0825	0.0877		0.0309	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Thorium 228	0.620		0.136	0.158		0.0824	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Thorium-232	0.838		0.220	0.236		0.0344	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Thorium-234	0.431	U	0.574	0.576		0.502	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Uranium-235	0.146	U	0.389	0.389		0.315	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Uranium-238	0.431	U	0.574	0.576		0.502	pCi/g	01/09/20 13:13	01/30/20 11:21	1

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# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Method: 905.0 - Total Beta Strontium (GFPC)

**Lab Sample ID:** MB 160-456430/6-A

**Matrix:** Solid

**Analysis Batch:** 458335

**Client Sample ID:** Method Blank

**Prep Type:** Total/NA

**Prep Batch:** 456430

Analyte	Result	MB	MB	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac
				Uncert. (2σ+/-)	Uncert. (2σ+/-)					
Total Beta Strontium	0.004382	U		0.0671	0.0671	0.160	pCi/g	01/10/20 08:39	01/28/20 09:14	1
<b>Carrier</b>		<b>MB</b>	<b>MB</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	89.7	%Yield	Qualifier	Limits				01/10/20 08:39	01/28/20 09:14	1

**Lab Sample ID:** LCS 160-456430/1-A

**Matrix:** Solid

**Analysis Batch:** 458335

**Client Sample ID:** Lab Control Sample

**Prep Type:** Total/NA

**Prep Batch:** 456430

Analyte	Spike Added	LCS	LCS	Count	Total	DLC	Unit	%Rec.	Limits	RER
				Uncert. (2σ+/-)	Uncert. (2σ+/-)					
Total Beta Strontium	7.93	7.920		0.644	0.644	0.160	pCi/g	100	75 - 125	
<b>Carrier</b>		<b>LCS</b>	<b>LCS</b>							
Sr Carrier	87.8	%Yield	Qualifier	Limits						

**Lab Sample ID:** 160-36892-1 DU

**Matrix:** Solid

**Analysis Batch:** 458335

**Client Sample ID:** PE-BS-VULCAN-S001

**Prep Type:** Total/NA

**Prep Batch:** 456430

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Count	Total	DLC	Unit	RER	RER Limit
					Uncert. (2σ+/-)	Uncert. (2σ+/-)				
Total Beta Strontium	-0.00264	U	0.03720	U	0.0761	0.0761	0.160	pCi/g	0.28	1
<b>Carrier</b>		<b>DU</b>	<b>DU</b>							
Sr Carrier	86.5	%Yield	Qualifier	Limits						

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID:** MB 160-456354/1-A

**Matrix:** Solid

**Analysis Batch:** 458631

**Client Sample ID:** Method Blank

**Prep Type:** Total/NA

**Prep Batch:** 456354

Analyte	Result	MB	MB	Count	Total	DLC	Unit	Prepared	Analyzed	Dil Fac	
				Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium-227	-0.2134	U		0.704	0.704	0.942	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Actinium-228	0.02416	U		0.0643	0.0643	0.311	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Americium-241	-0.06868	U		0.0789	0.0792	0.189	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Bismuth-212	-0.5048	U		0.515	0.518	1.62	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Bismuth-214	0.06621	U		0.0628	0.0631	0.404	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Cobalt-60	0.04081	U		0.0446	0.0448	0.200	0.0689	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Lead-210	0.1866	U		0.845	0.845	1.46	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Lead-212	-0.05490	U		0.0779	0.0782	0.229	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Lead-214	-0.04108	U		0.106	0.106	0.205	pCi/g	01/09/20 13:13	01/30/20 08:45	1	
Potassium-40	-0.2794	U		0.653	0.654	1.01	pCi/g	01/09/20 13:13	01/30/20 08:45	1	

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# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

**Lab Sample ID:** MB 160-456354/1-A

**Matrix:** Solid

**Analysis Batch:** 458631

**Client Sample ID:** Method Blank

**Prep Type:** Total/NA

**Prep Batch:** 456354

Analyte	Result	MB Result	MB Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
				Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Protactinium-231	0.0000005	U		2.91	2.91		5.05	pCi/g	01/09/20 13:13	01/30/20 08:45	1
	380										
Radium-228	0.02416	U		0.0643	0.0643		0.311	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Thallium-208	0.05322	U		0.0476	0.0479		0.0691	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Thorium 228	-0.05490	U		0.0779	0.0782		0.229	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Thorium-232	0.02416	U		0.0643	0.0643		0.311	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Thorium-234	-0.5675	U		0.636	0.639		1.76	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Uranium-235	0.09810	U		0.252	0.253		0.469	pCi/g	01/09/20 13:13	01/30/20 08:45	1
Uranium-238	-0.5675	U		0.636	0.639		1.76	pCi/g	01/09/20 13:13	01/30/20 08:45	1

**Lab Sample ID:** MB 160-456354/1-A

**Matrix:** Solid

**Analysis Batch:** 458634

**Client Sample ID:** Method Blank

**Prep Type:** Total/NA

**Prep Batch:** 456354

Analyte	Result	MB Result	MB Qualifier	Count	Total	LOQ	MDC	Unit	Prepared	Analyzed	Dil Fac
				Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Cesium-137	0.001115	U		0.0388	0.0388	0.0700	0.0727	pCi/g	01/09/20 13:13	01/30/20 11:21	1
Radium-226	-0.05198	U		0.0662	0.0664	0.200	0.199	pCi/g	01/09/20 13:13	01/30/20 11:21	1

**Lab Sample ID:** LCS 160-456354/2-A

**Matrix:** Solid

**Analysis Batch:** 458638

**Client Sample ID:** Lab Control Sample

**Prep Type:** Total/NA

**Prep Batch:** 456354

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	MDC	Unit	%Rec.	Limits
				Uncert. (2σ+/-)					
Americium-241	96.6	93.24		9.81		1.20	pCi/g	97	87 - 116
Cesium-137	27.3	27.02		2.89	0.0700	0.203	pCi/g	99	87 - 120
Cobalt-60	10.6	10.51		1.11	0.200	0.0981	pCi/g	99	87 - 115

**Lab Sample ID:** 160-36892-2 DU

**Matrix:** Solid

**Analysis Batch:** 458634

**Client Sample ID:** PE-BS-HANSON-S001

**Prep Type:** Total/NA

**Prep Batch:** 456354

Analyte	Sample Result	Sample Qual	DU	DU	Uncert. (2σ+/-)	LOQ	MDC	Unit	RER	Limit
			Result	Qual						
Actinium-227	0.217	U	0.2053	U	0.595		0.745	pCi/g	0.01	1
Actinium-228	0.657		0.7442		0.173		0.0916	pCi/g	0.16	1
Americium-241	0.0493	U	-0.09170	U	0.208		0.347	pCi/g	0.35	1
Bismuth-212	-0.537	U	-0.6710	U	1.07		1.78	pCi/g	0.06	1
Bismuth-214	0.561		0.5757		0.146		0.101	pCi/g	0.05	1
Cesium-137	-0.00082	U	-0.04370	U	0.0694	0.0700	0.116	pCi/g	0.32	1
	6									
Cobalt-60	0.0552		0.05267	U	0.0261	0.200	0.0896	pCi/g	0.04	1
Lead-210	2.03		1.167	U	1.23		1.50	pCi/g	0.29	1
Lead-212	0.653		0.7539		0.145		0.0815	pCi/g	0.34	1
Lead-214	0.607		0.6484		0.138		0.139	pCi/g	0.13	1
Potassium-40	11.5		10.02		1.78		0.747	pCi/g	0.39	1
Protactinium-231	-0.516	U	0.1399	U	1.51		4.80	pCi/g	0.14	1
Radium-226	0.561		0.5757		0.146	0.200	0.101	pCi/g	0.05	1

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# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-36892-2 DU

Client Sample ID: PE-BS-HANSON-S001

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 458634

Prep Batch: 456354

Analyte	Sample	Sample	DU		DU		Total		LOQ	MDC	Unit	RER	Limit
	Result	Qual	Result	Qual	(2σ+/-)	Uncert.							
Radium-228	0.657		0.7442		0.173		0.0916	pCi/g				0.16	1
Thallium-208	0.303		0.3074		0.0823		0.0530	pCi/g				0.03	1
Thorium 228	0.653		0.7539		0.145		0.0815	pCi/g				0.34	1
Thorium-232	0.657		0.7442		0.173		0.0916	pCi/g				0.16	1
Thorium-234	-1.29	U		0.1905	U	0.661		2.19	pCi/g			1.00	1
Uranium-235	-0.255	U		-0.09412	U	0.238		1.04	pCi/g			0.17	1
Uranium-238	-1.29	U		0.1905	U	0.661		2.19	pCi/g			1.00	1

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# QC Association Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

Rad

Leach Batch: 455846

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36892-1	PE-BS-VULCAN-S001	Total/NA	Solid	Dry and Grind	
160-36892-2	PE-BS-HANSON-S001	Total/NA	Solid	Dry and Grind	
160-36892-3	PE-BS-DUTRA-S001	Total/NA	Solid	Dry and Grind	
160-36892-1 DU	PE-BS-VULCAN-S001	Total/NA	Solid	Dry and Grind	
160-36892-2 DU	PE-BS-HANSON-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 456354

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36892-1	PE-BS-VULCAN-S001	Total/NA	Solid	Fill_Geo-21	455846
160-36892-2	PE-BS-HANSON-S001	Total/NA	Solid	Fill_Geo-21	455846
160-36892-3	PE-BS-DUTRA-S001	Total/NA	Solid	Fill_Geo-21	455846
MB 160-456354/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-456354/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-36892-2 DU	PE-BS-HANSON-S001	Total/NA	Solid	Fill_Geo-21	455846

Prep Batch: 456430

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-36892-1	PE-BS-VULCAN-S001	Total/NA	Solid	DPS-0	455846
160-36892-2	PE-BS-HANSON-S001	Total/NA	Solid	DPS-0	455846
160-36892-3	PE-BS-DUTRA-S001	Total/NA	Solid	DPS-0	455846
MB 160-456430/6-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-456430/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-36892-1 DU	PE-BS-VULCAN-S001	Total/NA	Solid	DPS-0	455846

Eurofins TestAmerica, St. Louis

# Tracer/Carrier Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS- Parcel E 500712

Job ID: 160-36892-2

## Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid

Prep Type: Total/NA

### Percent Yield (Acceptance Limits)

Lab Sample ID	Client Sample ID	Sr (40-110)
160-36892-1	PE-BS-VULCAN-S001	87.2
160-36892-1 DU	PE-BS-VULCAN-S001	86.5
160-36892-2	PE-BS-HANSON-S001	83.2
160-36892-3	PE-BS-DUTRA-S001	87.1
LCS 160-456430/1-A	Lab Control Sample	87.8
MB 160-456430/6-A	Method Blank	89.7

### Tracer/Carrier Legend

Sr = Sr Carrier

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